

REMARKS

Applicant appreciates the Examiner's thorough consideration provided the present application. Claims 21-40 are now present in the application. Claims 1-20 have been cancelled. Claims 21-40 have been added. Claims 21, 24, 27, 31 and 35 are independent. Reconsideration of this application, as amended, is respectfully requested.

Information Disclosure Citation

Applicant thanks the Examiner for considering the references supplied with the Information Disclosure Statement filed on September 27, 2006, and for providing Applicant with an initialed copy of the PTO-1449 form filed therewith.

Claim Objections

Claim 1 has been objected to due to the presence of minor informalities. Since claim 1 has been cancelled, Applicant respectfully submits that this objection has been obviated and/or rendered moot. Reconsideration and withdrawal of this objection are respectfully requested.

Claim Rejections Under 35 U.S.C. §§ 102 & 103

Claims 1-6, 10-13, 16, 17 and 20 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Takashi, JP 2001-0274096. Claims 6-9 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Emerson, U.S. Patent No. 6,958,497. Claims 14 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takashi in view of Yuasa, U.S. Patent No. 6,017,774. Claims 18 and 19 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over

Takashi in view of Koide, U.S. Patent Application Publication No. US 2001/0048112. These rejections are respectfully traversed.

Complete discussions of the Examiner's rejections are set forth in the Office Action, and are not being repeated here.

Without conceding to the propriety of the Examiner's rejections, but merely to timely advance the prosecution of the application, as the Examiner will note, claims 1-20 have been cancelled. Therefore, Applicant respectfully submits that these rejections have been obviated and/or rendered moot. Accordingly, reconsideration and withdrawal of the rejections under 35 U.S.C. §§ 102 and 103 are respectfully requested.

Additional Claims

Claims 21-40 have been added for the Examiner's consideration.

Independent claim 21 recites a combination of elements including "Al_yGa_{1-y}N/GaN short period superlattice (SPS) layers on the buffer layer in a sandwich structure of upper and lower layers having an undoped GaN layer interposed therebetween (where 0 < y ≤1)."

Independent claim 24 recites a combination of elements including "Al_yGa_{1-y}N/GaN short period superlattice (SPS) layers on the buffer layer in a sandwich structure of upper and lower layers having an undoped GaN layer or an indium-doped GaN layer interposed therebetween (where 0 < y ≤1)" and "a first GaN based layer above and in direct contact with the upper Al_yGa_{1-y}N/GaN SPS layer."

Independent claim 27 recites a combination of elements including "Al_yGa_{1-y}N/GaN short period superlattice (SPS) layers on the undoped GaN layer or the indium-doped GaN layer, in a

sandwich structure of upper and lower layers having the undoped GaN layer interposed therebetween (where $0 < y \leq 1$).”

Independent claim 31 recites a combination of elements including “ $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers on the undoped GaN layer or the indium-doped GaN layer, in a sandwich structure of upper and lower layers having the undoped GaN layer or the indium-doped GaN layer interposed therebetween (where $0 < y \leq 1$)” and “a first n type GaN based layer above and in direct contact with the upper $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ SPS layer.”

Independent claim 35 recites a combination of steps including “forming $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers on the buffer layer in a sandwich structure of upper and lower layers having an undoped GaN layer or an indium-doped GaN layer interposed therebetween (where $0 < y \leq 1$)” and “forming a first GaN based layer above and in direct contact with the upper $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ SPS layer.”

Support for the above combinations of elements and steps can be found in FIGs. 2 and 3 as originally filed. Applicant respectfully submits that the combinations of elements and steps set forth in new independent claims 21, 24, 27, 31 and 35 are not disclosed or suggested by the references relied on by the Examiner.

Emerson

The Examiner has correctly acknowledged that Emerson fails to teach previously presented independent claims 1, 4 and 12 because Emerson fails to teach $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers on a GaN-based buffer layer. Since all independent claims 21,

24, 27, 31 and 35 recite a similar feature, it is believed that independent claims 21, 24, 27, 31 and 35 clearly define the present invention over Emerson.

Takashi

The Examiner referred to Takashi's n-contact layer 7 as the first electrode and the super lattice reduction layers 40/50 as the $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers as recited in claims 1, 4, 6 and 12. As shown in FIG. 1 of Takashi, there is an additional undoped GaN layer 6 between the n-contact layer 7 and the upper super lattice reduction layer 50. Therefore, Takashi's n-contact layer 7 is not in direct contact with the upper super lattice reduction layer 50. Accordingly, Takashi fails to teach "a first GaN based layer above and in direct contact with the upper $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ SPS layer" as recited in new independent claim 24, "a first n type GaN based layer above and in direct contact with the upper $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ SPS layer" as recited in new independent claim 31, and "forming a first GaN based layer above and in direct contact with the upper $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ SPS layer" as recited in new independent claim 35.

In addition, as mentioned, the Examiner referred to Takashi's super lattice reduction layers 40/50 as the $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers of the present invention. However, as shown in FIG. 3 and paragraphs 53 and 65 of Takashi, Takashi's super lattice reduction layers 40/50 simply include indium-doped GaN and aluminum-doped GaN. Takashi's super lattice reduction layers 40/50 do not have an undoped GaN layer. Therefore, Takashi fails to teach the $\text{Al}_y\text{Ga}_{1-y}\text{N}/\text{GaN}$ short period superlattice (SPS) layers having an undoped GaN layer as recited in independent claims 21 and 27.

Accordingly, none of the utilized references individually or in combination teach or suggest the limitations of amended independent claims 21, 24, 27, 31 and 35. Therefore,

Applicant respectfully submits that amended independent claims 21, 24, 27, 31 and 35 clearly define over the teachings of the utilized references.

With regard to the Examiner's reliance on the secondary references, these references have only been relied on for their teachings related to some dependent claims. These references also fail to disclose the above combinations of elements and steps as set forth in amended independent claims 21, 24, 27, 31 and 35. Accordingly, these references fail to cure the deficiencies of Takashi and Emerson.

In addition, claims 22, 23, 25, 26, 28-30, 32-34 and 36-40 depend, either directly or indirectly, from new independent claims 21, 24, 27, 31 and 35, and are therefore allowable based on their respective dependence from new independent claim 21, 24, 27, 31 and 35, which are believed to be allowable.

Favorable consideration and allowance of claims 21-40 are respectfully requested.

Additional Cited References

Since the remaining patents cited by the Examiner have not been utilized to reject the claims, but rather to merely show the state of the art, no further comments are necessary with respect thereto.

CONCLUSION

All the stated grounds of rejection have been properly traversed and/or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently pending rejections and that they be withdrawn.

Application No. 10/517,818
Amendment dated February 27, 2007
Reply to Office Action of November 27, 2006

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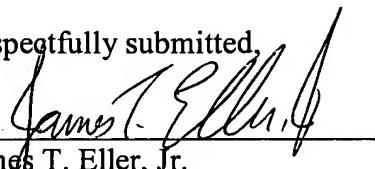
It is believed that a full and complete response has been made to the Office Action, and that as such, the Examiner is respectfully requested to send the application to Issue.

In the event there are any matters remaining in this application, the Examiner is invited to contact the undersigned at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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